REMARKS

Examiner G. Peralta is thanked for the continued Search and Examination of the Subject Application for Patent.

Claims 1, 8, 15, and 22 have been amended to further clarify that the impurities implanted in methods of Claims 1 and 15 consist of P_2^+ ions implanted in a single ion implantation step and the impurities implanted in the methods of Claims 8 and 22 consist of As_2^+ ions implanted in a single ion implantation step. The basis for this amendment to Claims 1, 8, 15, and 22 can be found in the Specification from page 7, line 4 through page 10, line 22. This part of the Specification gives a detailed description of the implantation of the P_2^+ ions and the As_2^+ ions into the source/drain regions and the polysilicon gate electrodes. This description describes only one implantation of the ions for each embodiment.

The next to the last element of each of Claims 1, 8, 15, and 22 have also been amended to replace "said ion implant beam" with -- said ion beam -- in order to remain consistent with the first occurrence of ion beam in each of the claims and provide proper antecedent basis.

Reconsideration of the Rejection of Claims 1-28 under 35 U.S.C. § 103(a) as being unpatentable over Current (U.S. Pat. No. 5,155,369) in view of Aitken (U.S. Pat. No. 4,578,589) is requested.

Current describes a two step ion implantation method. In one embodiment described by Current the first step implants a light dose of ions at an angle of 5-7 degrees away from the normal to the surface of the substrate. The second step implants a much larger dose directed along the normal to the surface of the substrate, see column 3, lines 35-60. In a variant of this embodiment the implantation energy is much smaller in the first implantation step than in the second implantation step, see column 4, lines 7-9.

In another embodiment described by Current the first implantation step is broken into a pair of substeps. In the first substep the ions are incident at an angle A with respect to the normal to the surface of the substrate. In the second substep the ions are incident at an angle -A with respect to the normal to the surface of the substrate, see column 4, lines 54-60.

In the methods described in Claims 1-28, as amended, source/drain regions or polysilicon electrodes are doped using a single ion implantation step using either P_2^+ ions, Claims 1-7 and 15-21, or As_2^+ ions, Claims 8-14 and 22-28. The ion implantation doping method described in Claims 1-28 uses a single ion implantation step. This single ion implantation step described in the methods of Claims 1-28 is significantly different from and not obvious from the two step ion implantation method described by Current.

The Examiner has argued that "in Col. 8, at the top, Current teaches a single implantation step of P_2^+ or As_2^+, followed by an implantation of another species". It is respectfully pointed out that from Column 7, line 59 through column 8, line 20 Current clearly describes "first and second implantation steps"; see column 7, lines 60-61; to achieve the required doping. The methods of Claims 1-28 require only a single ion implantation step to achieve the required doping. Claims 1-28, as amended, describe implanting only a single species of impurities, P_2^+ ions or As_2^+ ions, implanted using a single implantation step.

The Examiner has also argued that "the two step implantation of Current is not incident in the same region, the first implantation is performed at an angle such that

channeling effect is minimized when the actual source/drain region implantation is performed." It is respectfully pointed out that the first implantation described by Current is the only one which uses P_2^+ or As_2^+ ions. The second implantation step, when the actual source/drain implantation is performed, uses P^- or As^- ions but not P_2^+ or As_2^+ ions, see the table at the top of column 8 (lines 1-7). Claims 1-14 describe methods of forming source/drain regions using a single implantation of P_2^+ or As_2^+ ions. Claims 15-28 describe methods of doping a polysilicon electrode using a single implantation of P_2^+ or As_2^+ ions. We respectfully point out that the method of Current requires two implantation steps and the methods of Claims 1-28 specifically describe a single implantation step.

Aitken describes apparatus and methods for ion implantation. Aitken describes using a beam analyzing arrangement to selectively separate ion species in the beam on the basis of mass to produce an analyzed beam. However, Aitken does not make the use of a single ion implantation step using either P_2^+ ions or As_2^+ ions to dope source/drain regions or polysilicon electrodes, as is described in Claims 1-28, an obvious extension of Current.

It is believed that the single step ion implantation doping methods described in Claims 1-28, as amended, are different from, not obvious from, and patentably distinct from the two step ion implantation method described by Current in view of the ion implantation apparatus and methods described by Aitken. Reconsideration of the Rejection of Claims 1-28 under 35 U.S.C. § 103(a) as being unpatentable over Current in view of Aitken, and Allowance of Claims 1-28, are requested.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE."

It is requested that should Examiner Peralta not find that the Claims are now Allowable that the Examiner call the undersigned Agent at (845)-462-5363 to overcome any problems preventing allowance.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

Please rewrite Claims 1, 8, 15, and 22 as follows.

1. (TWICE AMENDED) A method of forming source/drain regions, comprising the steps of:

providing a semiconductor integrated circuit wafer having source/drain regions;

providing an ion implant apparatus;

placing a phosphorous ion source in said ion implant apparatus;

adjusting said ion implant apparatus so that said ion implant apparatus produces an ion beam comprising P_2^+ ions, wherein said ion beam has a beam density and a beam energy;

implanting [P_2^+ ions] impurities into said source/drain regions of said integrated circuit wafer, wherein said impurities consist of P_2^+ ions implanted using a single ion implantation step and said ion [implant] beam; and

annealing said integrated circuit wafer having P_2^+ ions implanted at an anneal temperature for an anneal time.

8. (TWICE AMENDED) A method of forming source/drain regions, comprising the steps of:

providing a semiconductor integrated circuit wafer having source/drain regions;

providing an ion implant apparatus;

placing an arsenic ion source in said ion implant apparatus;

adjusting said ion implant apparatus so that said ion implant apparatus produces an ion beam comprising As_2^+ ions, wherein said ion beam has a beam density and a beam energy;

implanting [As_2^+ ions] impurities into said source/drain regions of said integrated circuit wafer, wherein said impurities consist of As_2^+ ions implanted using a single ion implantation step and said ion [implant] beam; and

annealing said integrated circuit wafer having As_2^+ ions implanted at an anneal temperature for an anneal time.

15. (TWICE AMENDED) A method of doping a polysilicon electrode, comprising the steps of:

providing a semiconductor integrated circuit wafer having a polysilicon electrode formed thereon;

providing an ion implant apparatus;

placing a phosphorous ion source in said ion implant apparatus;

adjusting said ion implant apparatus so that said ion implant apparatus produces an ion beam comprising P_2^+ ions, wherein said ion beam has a beam density and a beam energy;

implanting [P_2^+ ions] impurities into said polysilicon electrode, wherein said impurities consist of P_2^+ ions implanted using a single ion implantation step and said ion

[implant] beam; and

annealing said integrated circuit wafer having P_2^+ ions implanted at an anneal temperature for an anneal time.

22. (TWICE AMENDED) A method of doping a polysilicon electrode, comprising the steps of:

providing a semiconductor integrated circuit wafer having a polysilicon electrode formed thereon;

providing an ion implant apparatus;

placing a arsenic ion source in said ion implant apparatus;

adjusting said ion implant apparatus so that said ion implant apparatus produces an ion beam comprising As_2^+ ions, wherein said ion beam has a beam density and a beam energy;

implanting [As_2^+ ions] impurities into said polysilicon electrode, wherein said impurities consist of As_2^+ ions implanted using a single ion implantation step and said ion [implant] beam; and

annealing said integrated circuit wafer having As_2^+ ions implanted at an anneal temperature for an anneal time.